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LIST OF FRESHWATER MUSSELS (UNIONOIDA) AT THE CLEVELAND MUSEUM OF NATURAL HISTORY

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ABSTRACT

Cataloged freshwater mussel (Bivalvia: Unionoida) specimens housed at The Cleveland Museum of Natural History are listed. The catalog number for each species, the number of lots and specimens, years and states of collection, and federal and Ohio state endangered status are given. The collection contains 5123 specimens in 1452 lots, representing 110 species from five families. Approximately one-third of all species in the collection are endangered, extirpated, or otherwise threatened according to Ohio or federal standards.

Introduction

Water quality deterioration has stressed numerous populations of aquatic organisms, including freshwater mussels (Bivalvia: Unionoida) (Strayer, 1999a). North America has the highest number of species of unionids in the world (Cummings and Mayer, 1992; Bogan, 1993; Parmalee and

Bogan, 1998; Nedeau et al., 2000) with some 300 species (Nedeau et al., 2000). Of the mussels endemic to North America, 75 percent are endangered, threatened, or species of special concern (Williams et al., 1993) with only 70 species stable throughout their range (Nedeau et al., 2000). The greatest declines have been found within the southeast-

ern United States where the highest numbers of species are located (Bogan, 1993). Insects and fishes are particularly well known as indicator organisms for determining habitat quality (Karr et al., 1986; Rosenberg and Resh, 1993). However, the use of freshwater mussels as indicators of water quality has been understudied (Strayer, 1999).

The declines have been caused by alteration of the habitats that the mussels are found in (Bogan, 1993). Impoundments, commercial exploitation, pollution, siltation, and habitat loss are contributing factors (Bogan, 1993; Brim-Box and Mossa, 1999; Waller et al., 1999). The introductions of the zebra and quagga mussels in the late 1980s have stressed endemic unionids even further (Schlosser and Napela, 1994; Ricciardi et al., 1996, 1998; Strayer and Smith, 1996; Strayer, 1999b).

Ohio has a history of studies of mussel population declines and regional losses of species richness. For instance, Hoggarth (1990) examined the Chagrin River of Northeastern Ohio and found that few species remained since the original northeastern Ohio survey work by Dean (1890). This suggests that the outlook for freshwater mussels is bleak, underscoring the need for well-cataloged historical collections. Because of the dire nature of the conservation status of freshwater mussels, collecting new specimens for ecological, conservation, and taxonomic studies is difficult and often impractical. Institutions such as natural history museums and universities that house unionid collections may represent the few remaining opportunities to study specimens. Museum collections of freshwater mussels may also be invaluable in reconstructing past unionid communities when published species lists are unavailable. The purpose of this paper is to make available the extensive freshwater mussel holdings at The Cleveland Museum of Natural History (CMNH) to facilitate future use of the specimens.

This paper lists the taxa in the collection as well as the CMNH catalog number, the number of lots and specimens, the states and years of collection, and the federal and Ohio endangered status. In some cases, older specimens do not have complete collection data (i.e., a date of collection). However, using archived information on the collectors and/or donors, a reasonable estimated range of years was determined. Because many of these specimens are >50 years old, they represent important historical records for their localities.

Results and Discussion

The CMNH collection of Unionoidea consists of 5123 specimens in 1452 lots, and 110 species from 5 families; 37 species are listed as species of special interest, threatened, endangered, or extirpated in Ohio. Nine specimens in three lots represent the tubercled blossom (*Epioblasma torulosa torulosa*, Fig. 1), three specimens from one lot represent the scaleshell (*Leptodea leptodom*), and three specimens in two lots represent the rock pocketbook (*Arcidens confragosus*), which have been extirpated from Ohio. Ten species are listed as federally endangered (<http://www.fws.gov>). Although

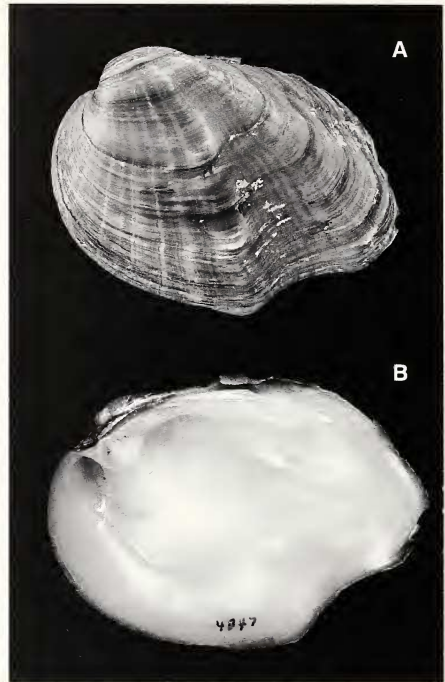


Figure 1. The tubercled blossom, *Epioblasma torulosa torulosa* (Rafinesque, 1820), currently extirpated from Ohio; A, shell exterior (maximum length = 6.0 cm); B, shell interior.

new specimens continue to be deposited in the collection, most species are represented from collections made > 50 years ago. Forty species are at least partially represented by specimens >100 years old (Appendix). Considering the current extreme loss of habitat and the reduction in unionid species distribution, natural history collections become invaluable for reconstructing historical distributions, and for studying species when it is impractical or impossible to collect and sacrifice new specimens.

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Appendix. List of freshwater mussels currently cataloged at The Cleveland Museum of Natural History (CMNH). The species, CMNH catalog number, number of lots and specimens, Ohio and federal endangered codes, and states and years of collection are given. Nomenclature follows that of Cummings and Mayer (1992) and Stansbery and Borror (1999). Ohio endangered codes: 1 = endangered, 2 = threatened, 3 = special concern, 4 = extirpated. Federal endangered code: E = federally endangered.

Taxa	CMNH catalog number	Lots	Count	Endangered codes		
				Ohio	Federal	States (years)
MARGARITIFERIDAE						
(MARGARITIFERINAE)						
<i>Margaritifera falcata</i> (Gould, 1850)	0101-01	3	5			OR (1901-02)
<i>M. margaritifera</i> (Linnaeus, 1758)	0101-01	4	13			CT (1930); MA (1978); ME (1902, 1905)
<i>M. marrianae</i> Johnson, 1983	0101-01	2	4			AL (1909, 1952)
UNIONIDAE (ANODONTINAE)						
<i>Alasmodonta heterodon</i> (Lea, 1829)	0201-08	4	11	E		CT (1940); MD (1913); VA (1901); VT (1901)
<i>A. marginata</i> Say, 1818	0201-08	13	40			IA (1954); MD (1908); OH (1902, 1927, 1930, 1940, 1951-1955, 1999)
<i>A. undulata</i> (Say, 1817)	0201-08	9	17			CT (1940); DC (1901-02); MA (1941); MD (1910); PA (1930); VA (1902)
<i>A. varicosa</i> (Lamarck, 1819)	0201-08	3	7			MD (1901-02, 1914)
<i>A. viridis</i> (Rafinesque, 1820)	0201-08	6	15			CT (1940); MI (1909); OH (1943, 1952)
<i>Anodonta californiensis</i> Lea, 1852	0201-02	1	10			CA (1954)
<i>A. nuttalliana</i> Lea, 1838	0201-02	2	3			CA (1901, 1916)
<i>A. suborbiculata</i> Say, 1831	0201-02	2	4	3		IL (1892)
<i>Anodontoides ferussacianus</i> (Lea, 1834)	0201-05	10	27			IN (1949); OH (1931, 1939-40, 1942-43, 1952-53, 1982)
<i>Arcidens confragosus</i> (Say, 1829)	0201-10	2	3	4		IA (1902); IL (1952)
<i>Lasmigona c. complanata</i> (Barnes, 1823)	0201-13	19	47			MI (1909); OH (1936, 1939, 1949, 1952, 1955)
<i>L. compressa</i> (Lea, 1829)	0201-13	7	10			GA (1930); MI (1905); OH (1935-36, 1951-52)
<i>L. costata</i> (Rafinesque, 1820)	0201-13	60	134			IA (1917); MI (1905, 1909, 1912); OH (1927, 1938-41, 1943-44, 1949, 1951-56); TN (1952)
<i>L. subviridis</i> (Conrad, 1835)	0201-13	2	15			FL (1870); NY (1952)
<i>Pygenodon cataracta cataracta</i> (Say, 1817)	0201-04	12	25			CT (1930, 1940); DC (1902); MD (1913); ME (1930); PA (1940); VA (1903, 1905)
<i>P. c. marginata</i> (Say, 1817)	0201-04	1	2			DC (1902)
<i>P. grandis grandis</i> (Say, 1829)	0201-04	83	209			IA (1954); LA (1943); MI (1909, 1912, 1949); OH (1935-36, 1938-42, 1945, 1949-56, 1967, 1977, 1998-1999); TX (1930, 1951); WI (1940)
<i>Simpsonaias ambigua</i> (Say, 1825)	0201-12	1	1	3		OH (1952)
<i>Strophitis undulatus tennesseensis</i> Frierson, 1927	0201-07	1	1			TN (1940)

Taxa	CMNH catalog number	Lots	Count	Endangered codes		States (years)
				Ohio	Federal	
<i>S. u. undulatus</i> (Say, 1817)	0201-07	52	131			CT (1940); DC (1901); MD (1913); MI (1905,1909, 1912); OH (1902,1921,1927, 1936,1939-41, 1943-44, 1949-55,1978)
<i>Utterbackia imbecillis</i> (Say, 1829)	0201-03	7	30			MD (1936); OH (1941,1952,1954)
AMBLEMIDAE (AMBLEMIDAE)						
<i>Amblema plicata plicata</i> (Say, 1817)	0301-07	82	188			AR (1929,1931); IA (1954); IL (1902); IN (1902); KY (1950); MI (1905,1908-09, 1912,1949,1953); NY (1952); OH (1902, 1927,1931,1938-40,1943, 1949, 1951-55, 1967); TN (1865); TX (1901, 1951,1954)
<i>Cantilyria collina</i> (Conrad, 1837)	0301-16	1	1			VA (1940)
<i>C. spinosa</i> (Lea, 1836)	0301-16	2	3			GA (1910); MD (1917)
<i>Cyclonaias tuberculata</i> (Rafinesque, 1820)	0301-10	13	25	3		KY (1950); MI (1905,1912,1940); OH (1939-40,1951, 1954-1955); TN (1940)
<i>Elliptio buckleyi</i> complex (Lea, 1843)	0301-15	2	10			FL (1902,1928)
<i>E. complanata</i> (Lightfoot, 1786)	0301-15	56	567			CT (1930,1938,1940); DC (1901-02); GA (1902); MA (1900); MD (1900-1902, 1907-08, 1910, 1913-15); NH (1952,1956); NY (1905,1909,1921, 1952); OH (1936); VA (1903, 1905)
<i>E. congarea</i> (Lea, 1831)	0301-15	1	1			GA (1940)
<i>E. crassidens crassidens</i> (Lamarck, 1819)	0301-15	3	3	1		IN (1902); OH (1930); TN (1930)
<i>E. dilatata</i> (Rafinesque, 1820)	0301-15	45	147			AR (1952); KY (1941,1950); MI (1905,1909, 1925, 1949, 1953); OH (1927,1936-37, 1939,1944, 1949-56, 1999); TN (1930)
<i>E. downiei</i> (Lea, 1858)	0301-15	1	3			GA (1956)
<i>E. fisheriana</i> (Lea, 1838)	0301-15	7	29			DC (1902); MD (1900,1907); VA (1903, 1905)
<i>E. fisheriana</i> complex (Lea, 1838)	0301-15	1	4			NC (1906)
<i>E. hopetonensis</i> (Lea, 1838)	0301-15	1	1			GA (1940)
<i>E. lanceolata</i> (Lea, 1827)	0301-15	1	1			CT (1930)
<i>Fusconaias ebena</i> (Lea, 1831)	0301-09	4	7	2		KY (1950); OH (1930); TN (1940)
<i>F. flava</i> (Rafinesque, 1820)	0301-09	37	162			MI (1949,1953,1956); OH (1902,1924, 1930-31, 1943, 1949,1951,1953-55); TN (1865); WI (1930)
<i>F. maculata maculata</i> (Rafinesque, 1820)	0301-09	12	24	1		KY (1941); OH (1927,1940,1953-55)
<i>Gonidea angulata</i> (Lea, 1838)	0301-20	1	6			CA (1908)
<i>Hemistena lata</i> (Rafinesque, 1820)	0301-19	1	1	1	E	OH (1940)
<i>Lexingtonia dolabelloides</i> (Lea, 1840)	0301-11	1	1			TN (1865)
<i>Megalonaias boykiniana</i> (Lea, 1840)	0301-01	2	2			FL (1952); GA (1952)

Taxa	CMNH catalog number	Lots	Count	Endangered codes		States (years)
				Ohio	Federal	
<i>M. n. nervosa</i> (Rafinesque, 1820)	0301-01	7	9	1		IN (1902); KY (1950); TN (1940); TX (1951,1954)
<i>Plectomerus dombeyana</i> (Valenciennes, 1827)	0301-03	2	4			TX (1954,1957)
<i>Plethobasus cicatricosus</i> (Say, 1829)	0301-12	1	1	1	E	TN (1940)
<i>P. cyphus</i> (Rafinesque, 1820)	0301-12	2	3	1		OH (1955); TN (1930)
<i>P. striatus</i> (Rafinesque, 1820)	0301-12	3	5			OH (1930); TN (1865,1940)
<i>Pleurobema clava</i> (Lamarck, 1819)	0301-13	8	15	1	E	IL (1905); IN (1904,1944); OH (1927, 1949, 1952); TN (1910)
<i>P. cordatum</i> (Rafinesque, 1820)	0301-13	5	7	1		IN (1956); KY (1950); OH (1912,1930,1940)
<i>P. plenum</i> (Lea, 1840)	0301-13	2	2	1	E	IL (1905); TN (1940)
<i>P. rubrum</i> (Rafinesque, 1820)	0301-13	3	6	1		IN (1956); OH (1930,1954)
<i>P. sintoxia</i> (Rafinesque, 1820)	0301-13	27	60	3		IL (1930); MI (1905,1949,1953); OH (1927,1943, 1953-1955)
<i>Quadrula apiculata apiculata</i> (Say, 1829)	0301-06	1	2			TX (1902)
<i>Q. asperata asperata</i> (Lea, 1861)	0301-06	1	1			TX (1954)
<i>Q. cylindrica cylindrica</i> (Say, 1817)	0301-06	11	20	1		AR (1958); IN (1902,1952); OH (1927, 1940, 1951, 1953-55)
<i>Q. metanevra</i> (Rafinesque, 1820)	0301-06	2	2	1		AL (1954); TN (1940)
<i>Q. nodulata</i> (Rafinesque, 1820)	0301-06	3	4	1		IL (1902); KY (1950); OH (1940)
<i>Q. pustulosa pustulosa</i> (Lea, 1831)	0301-06	27	50			IA (1954); MI (1909,1949); MO (1901); KY (1950); OH (1940,1951,1953-55); TN (1862,1869,1940)
<i>Q. quadrula</i> (Rafinesque, 1820)	0301-06	19	34			IL (1958); KY (1950); MI (1909); OH (1951,1953-55, 1958,1967)
<i>Tritogonia verrucosa</i> (Rafinesque, 1820)	0301-04	27	75			AL (1954); AR (1939); IA (1902); IL (1902); IN (1902); OH (1927,1930,1951,1953-55); TN (1940); TX (1954)
<i>Uniomerus tetralasmus</i> (Say, 1831)	0301-22	1	2	2		KS (1907)
AMBLEMIDAE (LAMPASILINAE)						
<i>Actinoaia ligamentina ligamentina</i> (Lamarck, 1819)	0302-07	29	66	4		AR (1952); IN (1902); OH (1921,1935, 1940,1949, 1952-1955)
<i>A. l. orbis</i> Morrison, 1942	0302-07	1	1			TN (1940)
<i>Cyprogenia aberti</i> (Conrad, 1850)	0302-03	1	1			AR (1958)
<i>C. stegaria</i> (Rafinesque, 1820)	0302-03	7	23	1	E	IL (1905); IN (1898,1902); OH (1951, 1954-55)TN (1930)
<i>Ellipsaria lineolata</i> (Rafinesque, 1820)	0302-08	5	13	1		IA (1956); OH (1940,1952-53); TN (1930)

Taxa	CMNH catalog number	Lots	Count	Endangered codes		States (years)
				Ohio	Federal	
<i>Eptioblasma biemarginata</i> (Lea, 1857)	0302-20	1	1			TN (1910)
<i>E. brevidens</i> (Lea, 1831)	0302-20	1	2		E	TN (1865)
<i>E. rangiana</i> (Lea, 1838)	0302-20	1	2			IL (1905)
<i>E. torulosa torulosa</i> (Rafinesque, 1820)	0302-20	3	9	4	E	IL (1905); OH (1956); TN (1865)
<i>E. triquetra</i> (Rafinesque, 1820)	0302-20	17	90	2		OH (1940-41, 1943, 1951, 1953-54, 1958)
<i>Glebula rotundata</i> (Lamarck, 1819)	0302-06	1	1			TX (1910)
<i>Lampsilis cariosa</i> (Say, 1817)	0302-19	11	44			DC (1902); MD (1901, 1916, 1952); NY (1935); TX (1954); VA (1940)
<i>L. dolabraeformis</i> (Lea, 1830)	0302-19	1	2			GA (1953)
<i>L. fasciola</i> Rafinesque, 1820	0302-19	4	8	3		IN (1902, 1952); OH (1953-54)
<i>L. ovata</i> (Say, 1817)	0302-19	11	47	1		MI (1909); OH (1940, 1951, 1953-55); TX (1940)
<i>L. radiata hydiana</i> (Lea, 1838)	0302-19	1	4			TX (1954)
<i>L. r. luteola</i> (Lamarck, 1819)	0302-19	169	745			IA (1917); IL (1902); MI (1902, 1905, 1909, 1912, 1949-50, 1953); NY (1949-50); OH (1902, 1921, 1924, 1927, 1935-36, 1938-41, 1943-45, 1949-56, 1958-59, 1967, 1996); PA (1949); VA (1940)
<i>L. r. radiata</i> (Gmelin, 1791)	0302-19	23	118			DC (1900-02, 1910, 1912); FL (1940); MD (1905); NH (1952); OH (1953, 1955); PA (1940); VA (1901, 1903, 1905, 1930)
<i>L. saturata</i> (Lea, 1852)	0302-19	1	1			TX (1954)
<i>L. splendida</i> (Lea, 1838)	0302-19	1	2			TN (1940)
<i>L. teres teres</i> (Rafinesque, 1820)	0302-19	2	7	1		IA (1956); TX (1954)
<i>L. ventricosa</i> (Barnes, 1823)	0302-19	111	350			IA (1954); IL (1902); KY (1952); MI (1905, 1912, 1949-1950, 1952-53); NY (1902); OH (1927, 1930-31, 1935-36, 1938-39, 1941-1944, 1949, 1951-56, 1958, 1967); VT (1902)
<i>Leptodea fragilis</i> (Rafinesque, 1820)	0302-11	58	315			AL (1913); IN (1902); MI (1949-50, 1953, 1956); OH (1937, 1940-41, 1943, 1950, 1953-54, 1956, 1958, 1967); TX (1954)
<i>L. leptodon</i> (Rafinesque, 1820)	0302-11	1	3	4		OH (1930)
<i>L. ochracea</i> (Say, 1817)	0302-11	2	6			PA (1940); VA (1940)
<i>Ligumia nasuta</i> (Say, 1817)	0302-15	37	96	1		DC (1902); MD (1903); MI (1949, 1953); NC (1906); NY (1952); OH (1930, 1940, 1949, 1953-55); TX (1910, 1951, 1956); VA (1901, 1905)
<i>L. recta</i> (Lamarck, 1819)	0302-15	27	106	2		IA (1952); MI (1940, 1950, 1952); OH (1912, 1949, 1952-56, 1967)
<i>Obliquaria reflexa</i> Rafinesque, 1820	0302-02	17	50	2		AL (1956); IL (1902, 1910); MI (1949-50, 1953); OH (1954, 1967); TN (1940); TX (1954)

Taxa	CMNH catalog number	Lots	Count	Endangered codes		
				Ohio	Federal	States (years)
<i>Obovaria olivaria</i> (Rafinesque, 1820)	0302-09	2	2	1		KY (1950); TN (1940)
<i>O. reusa</i> (Lamarck, 1819)	0302-09	4	8	1	E	OH (1910); TN (1910,1921,1940)
<i>O. subrotunda</i> (Rafinesque, 1820)	0302-09	8	26			OH (1925,1940-41,1943,1954); TN (1940)
<i>Potamilus alatus</i> (Say, 1817)	0302-12	85	453			IL (1952); IN (1902); MI (1949-50,1953, 1956); NY (1949); OH (1869,1924,1937, 1940, 1943,1949, 1952-56,1958,1967, 1979,1999)
<i>P. amphichaenus</i> (Frierson, 1898)	0302-12	1	5			TX (1954)
<i>P. purpuratus</i> (Lamarck, 1819)	0302-12	3	4			TX (1951,1954)
<i>Psychobranchus fasciolaris</i> (Rafinesque, 1820)	0302-01	29	86			MI (1909,1953); OH (1927,1943,1949-51, 1953-55); TN (1940)
<i>P. greeni</i> (Conrad, 1834)	0302-01	1	2		E	AL (1952)
<i>P. occidentalis</i> (Conrad, 1836)	0302-01	3	6			AR (1952)
<i>P. subtentum</i> (Say, 1825)	0302-01	1	2			TN (1956)
<i>Toxolasma pautus</i> (Lea, 1840)	0302-13	1	1			FL (1909)
<i>T. parvus</i> (Barnes, 1823)	0302-13	1	1			OH (1951)
<i>Truncilla donaciformis</i> (Lea, 1828)	0302-10	10	87	2		IA (1956); MI (1949); OH (1943,1954-55)
<i>T. truncata</i> Rafinesque, 1820	0302-10	14	45	3		AR (1956); IL (1910); IN (1902); MI (1949, 1953); OH (1954-56); TN (1940)
<i>Villosa amygdala</i> (Lea, 1843)	0302-18	2	8			FL (1902)
<i>V. fabalis</i> (Lea, 1831)	0302-18	3	6	1		MI (1949); OH (1940,1951)
<i>V. iris iris</i> (Lea, 1829)	0302-18	7	14			MI (1912); OH (1949,1952-53,1996,1999); WI (1940)
HYRIIDAE (HYRIINAE)						
<i>Diplodon charruanus</i> (d'Orbigny, 1835)	0401-07	1	2			VA (1940)
TOTALS		1452	5123			